

REMARKS

This application has been reviewed in light of the Office Action dated April 7, 2009. Claims 9, 10, 12, 13, and 15 are presented for examination, of which Claim 9 and 13 are in independent form. Claims 11 and 14 have been withdrawn from consideration. Claims 9, 10, 12, 13, and 15 have been amended. Applicant requests favorable reconsideration and allowance of the subject application.

At paragraph 4 of the Office Action Claims 13 and 15 were objected to under 37 CFR § 1.75(c) as being in improper multiple dependent form. Without conceding the propriety of the objection, Applicant has amended Claims 13 and 15 in a manner that renders the objection moot. Applicant submits that the objection to Claims 13 and 15 has been obviated and respectfully requests that the objection to Claims 13 and 15 be withdrawn.

Claims 13 and 15 have been rejected under 35 U.S.C. § 112, first paragraph. Paragraph 6 of the Office Action asserts that there is no support in the specification for the phrase “the additional board comprises on its upper surface further contact areas which are soldered to the rear side contacts of the light emitting diode” in Claim 13. Applicant submits that the phrase is supported, at least, for example, at paragraph [021] and Fig. 1 of the specification. Specifically paragraph [021] states:

In accordance with Fig. 1, an LED die 3 ($R_{th, LED\ die}$) is applied to a contact surface (e.g. conductor path 5) of an LED PCB 6 ($R_{th, LED\ PCB}$) by means of a die adhesive 4. The LED die 3 in Fig. 1 is mounted face up and connected via bonding wires 2 with the contact surfaces (conductor path 5). Alternatively thereto, this can also be arranged in a face down mounting directly on the LED PCB 6 or this can be attached face down to a die carrier, and the latter then

arranged on the LED PCB. Together with the rear side contacts 7 ($R_{th, solder\ pads}$) of the LED PCB 6 this arrangement represents a self-contained LED lamp. For further processing, this LED lamp can be assembled by means of a mounting technology (e.g. SMT) on a board 9 ($R_{th, board}$), which is then optionally connected with a cooling body 11, e.g. via a solder area 10 ($R_{th, solder\ area}$).

Emphasis added. Accordingly, Applicant respectfully requests that the rejection of Claim 13 be withdrawn.

Claims 9, 10, 12, 13, and 15 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for the reasons to be discussed below.

Applicant traverses the points made in paragraphs 9 and 10 of the Office Action. First, Applicant respectfully directs the Examiner's attention to paragraph [022] of the specification which clarify how a diode can comprise a plurality of dies, according to one, non-limiting example embodiment of the invention. In particular, paragraph [022] states that "The LED die 3 is normally cast in a material 1 having appropriate optical characteristics. The LED die can also – as is known – be placed in a reflector. Of course, also a plurality of LED dies can be cast together or put in place in a reflector." Thus more than one die can be provided.

Also, according to MPEP 2111.01(IV) "An applicant is entitled to be his or her own lexicographer ... The specification should also be relied on for more than just explicit lexicography or clear disavowal of claim scope to determine the meaning of a claim term when applicant acts as his or her own lexicographer; the meaning of a particular claim term may be defined by implication, that is, according to the usage of the term in the context in the specification. See *Phillips v. AWH Corp.*, 415 F.3d 1303, 75

USPQ2d 1321 (Fed. Cir. 2005) (en banc); and *Vitronics Corp. v. Conceptronic Inc.*, 90 F.3d 1576, 1583, 39 USPQ2d 1573, 1577 (Fed. Cir. 1996).”

Accordingly, in view of at least paragraph [022] of the Specification, one skilled in the art clearly would be able to discern that Applicant’s defining of a light emitting diode that comprises one or more dies, as set forth in Claim 9, is entirely appropriate. If the Examiner disagrees, she is respectfully requested to explain why Applicant is not entitled to be his own lexicographer, despite MPEP 2111.01(IV).

Second, paragraph 10 of the Office Action regarding Claim 13 is, frankly, not understood. The applicable language in Claim 13 is “at least one light emitting diode”. The specification is replete with support for such a feature (see, e.g., paragraphs [001] and [022]). Moreover, Claim 13 recites “at least one light emitting diode” only once, and thus it is absolutely clear as to which diode is being referred to. Thus, the assertion in paragraph 10 of the Office Action is traversed.¹ If the Examiner still refuses to withdraw the subject rejection of Claim 13, she is respectfully requested to contact the undersigned at the contact number below in order to clarify her reasoning.

At paragraphs 11 and 12 of the Office Action, Claim 13 was deemed unclear because of the phrases “its upper surface” and “the rear side contacts of the light emitting diode”, respectively. As amended, Claim 13 recites, in part, “wherein the additional board comprises on an upper surface thereof”, and “the light emitting diode printed circuit board comprising at a lower surface thereof rear side contacts”. Applicant

¹It also is noted that the use of “at least one” in patent claims is notoriously prevalent and permissible. See, e.g., U.S. Patent 6,640,868 (Guggisberg).

submits that the issues raised in paragraphs 11 and 12 of the Office Action are now obviated.

At paragraph 13 of the Office Action, the phrase "at least one of the through-contacts", recited in Claim 15 was deemed unclear for not identifying which plurality of through-contacts are referred to. Without conceding the propriety of the rejection, Claim 15 has been amended in a manner which is deemed to obviate the rejection.

For the foregoing reasons, the withdrawal of all Section 112 rejections is requested.

Claim 9 was rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. Appl'n. Pub. 2002/0001192 (*Suehiro et al.*)(hereinafter "*Suehiro*"). Claims 10 and 12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Suehiro* in view of U.S. Pat. Appl'n. Pub. 2003/0189829 (*Shimizu*); and Claims 13 and 15 were rejected as being unpatentable over *Suehiro* in view of U.S. Pat. 6,614,103 (*Durocher et al.*)(hereinafter "*Durocher*"). Applicant submits that independent Claims 9 and 13, together with the claims dependent therefrom, are patentably distinct from the cited art for at least the following reasons.

Claim 9 is directed to a light emitting diode that includes at least one light emitting diode die, arranged on a light emitting diode printed circuit board by means of a die attach. The light emitting diode printed circuit board includes rear side contacts at a lower surface of the printed circuit board. The rear side contacts at least partially overlap with contours of the light emitting diode die and are formed in such a way as to overlap with at least half of the lower surface of the printed circuit board. The printed circuit

board comprises a plurality of through-contacts thermally and electrically connecting the rear side contacts to contact areas formed on an upper surface of the printed circuit board.

Among other notable features of Claim 9 is that the rear side contacts at least partially overlap with contours of the light emitting diode die and are formed in such a way as to overlap with at least half of the lower surface of the printed circuit board.

Page 4 of the Office Action relies on Figures 1A to 1D of *Suehiro* and the corresponding description thereof (e.g., paragraphs 41 to 56) in support of the rejection of Claim 9. Applicant has reviewed Figures 1A-1D and paragraphs 41 to 56, but does not find anything therein that teaches or suggests that any connections placed on the rear side “at least partially overlap with contours of the light emitting diode die and are formed in such a way as to overlap with at least half of the lower surface of the printed circuit board”, as recited in Claim 9. Moreover, Applicant submits that the arrangements shown in Figures 2a, 2b, 8 and 9 of *Suehiro* also do not teach or suggest this feature of Claim 9 because nothing in *Suehiro* mentions anything about whether the schematically shown conductive pattern of the PCB covers at least half of the PCB’s surface, particularly since there is no indication in *Suehiro* about the relative scale of the elements shown in those schematics.

As understood from paragraph [0042] and Figures 1A to 1D of *Suehiro*, the printed circuit board 2A apparently has a base 2 having upper, lower, and side surfaces, 2a, 2c, 2b, respectively. Figure 1D shows a diagram of the lower surface 2c. The Office Action asserts, at page 4, that reference 6 in Figs. 1A-1D correspond to the “rear side contacts” recited in Claim 9. Paragraph [0044] of *Suehiro* states, in part,

The separate leads 6R, 6B, 6B comprise electrode faces 6R₁, 6G₁, 6B₁ provided on the upper surface 2a of the base 2 and connections 6R₂, 6G₂, 6B₂ provided on the lower surface 2c of the base 2. The common lead 6C comprises an electrode face 6C₁ provided on the upper surface 2a of the base 2, a connection 6C₂ provided on the side face 2b of the base 2 and a heat radiating section 6C₃ provided on the lower surface 2c of the base 2.

However, none of the connections, 6G₂, 6R₂, 6B₂, provided on the lower surface 2c (i.e., rear side) at least partially overlap with contours of a light emitting diode die, as recited in Claim 9. Furthermore, nothing in *Suehiro* teaches or suggests that any portion of the common lead 6C includes anything that can be considered a “rear side contact”. Also, it is not clear from *Suehiro* whether element 6C₃ can even be considered an electrical rear side contact. Instead, with respect to element 6C, paragraph *Suehiro* states merely that “The common lead 6C comprises an electrode face 6C₁ provided on the upper surface 2a of the base 2, a connection 6C₂ provided on the side face 2b of the base 2 and a heat radiating section 6C₃ provided on the lower surface 2c of the base 2.” (emphasis added) (see, e.g., paragraph [0044]).

Accordingly, for these reasons, Applicant submits that Claim 9 is allowable over *Suehiro*. If the Examiner disagrees, she is respectfully requested to explain where she believes *Suehiro* teaches rear side contacts that at least partially overlap with contours of a light emitting diode die and are formed in such a way as to overlap with at least half of a lower surface of a printed circuit board.

Claim 13 recites, in part, that rear side contacts at least partially overlap with contours of the light emitting diode die and are formed in such a way as to overlap with at least half of the lower surface of the printed circuit board, the total surface area of the further contact areas is at least half of the area of the lower surface of the light emitting

diode printed circuit board, and the additional board comprises a further plurality of through-contacts thermally and electrically connecting at least one of the further contact areas to a solder area formed at a lower surface of the additional board.

For at least the same reasons as discussed in connection with Claim 9, nothing in *Suehiro* is believed to teach or suggest that rear side contacts at least partially overlap with contours of the light emitting diode die and are formed in such a way as to overlap with at least half of the lower surface of the printed circuit board, as set forth in Claim 13.

Lines 17-22 of paragraph 18 of the Office Action asserts that, “Durocher et al. teach in Fig. 4 and related text the additional board 41 comprises on its upper surface 43 further contact areas 50 which are soldered to the rear side contacts of the light emitting diode, wherein the additional board comprises a further plurality of through-contacts 51 thermally and electrically connecting at least one of the further contact areas to a solder area 47 formed on the bottom 45 of the additional board.”

Regarding Figures 4 and 5, *Durocher* states, at column 4, line 63 to column 5, line 16,

FIGS. 4 and 5 illustrate two preferred alternative aspects of the second step in the method making the LED array module after the first step of providing the carrier. In the first preferred aspect, an anisotropic conductive adhesive connects the carrier(s) 31 (and 21) to a flexible module base 41, as illustrated in FIG. 4. For example, a first side 43 of the flexible base 41 is attached or adhered to the second side 33 of the carrier 31. A first portion 47 of a conductive interconnect pattern is formed on the second side 45 of the flexible base. A plurality of second portions 49 of the conductive interconnect pattern extend through vias 51 in the base 41 to the first side 43 of the base. Preferably, the second portions 49 connect to a conductive

interconnect pattern 50 formed on the first side 43 of the flexible base 41. An anisotropic conductive adhesive layer 53 adheres the base 41 to the carrier 31. The second portions 49 of the conductive interconnect pattern contact the adhesive layer 53, which in turn contacts the feed through electrodes 37 exposed in the second side 33 of the carrier 31. Thus, the interconnect pattern 47, 49, 50 is electrically connected to the electrodes 37.

Element 50 is identified in the reference as an interconnect pattern, and element 51 identifies vias in the base 41 to the first side 43 of the base. Apparently, adhesive layers 53 (Fig. 4) and 55 (Fig. 5) attach the base 41 to the carrier 31. Moreover, the anisotropic conductive adhesive layer 53, illustrated in Fig. 4 can be conductive in the z-axis (i.e., vertical plane), isolating in an x-y plane perpendicular to the z-axis, and contains conductive particles. Z-axis adhesive layer manufactured by 3M Inc. is given as an example of such a conductive layer 53 (see, *Durocher*, column 5, line 63 to column, line 9). Further, as discussed at column 6, lines 20-22, the adhesive layer 55 can be a conductive or an electrically isolating layer. Also, as understood by Applicant, the electrical (and partially the thermal) contacts between the base 41 and the carrier 31 of Fig. 5 of *Durocher*, are realized by the feed through electrodes 37 and metal interconnect pattern (47, 49, 51) according to a high density interconnect method. However, *Durocher* does not mention anything about soldered contacts in connection with the embodiments shown in Figs. 4 and 5.

Accordingly *Durocher* does not teach or suggest that the additional board comprises a further plurality of through-contacts thermally and electrically connecting at least one of the further contact areas to a solder area formed at a lower surface of the additional board.

Also, nothing in Figs. 4 or 5, and the corresponding discussion of those embodiments in *Durocher*, indicate anything about relative dimensions of the depicted elements. Accordingly, *Durocher* does not teach or suggest that the total surface area of the further contact areas is at least half of the area of the lower surface of the light emitting diode printed circuit board.

Applicants submit that a combination of *Suehiro* and *Durocher*, assuming such combination would even be permissible, would fail to teach or suggest that rear side contacts at least partially overlap with contours of the light emitting diode die and are formed in such a way as to overlap with at least half of the lower surface of the printed circuit board, the total surface area of the further contact areas is at least half of the area of the lower surface of the light emitting diode printed circuit board, and the additional board comprises a further plurality of through-contacts thermally and electrically connecting at least one of the further contact areas to a solder area formed at a lower surface of the additional board, as recited in part in Claim 13.


A review of the other art of record has failed to reveal anything that, in Applicant's opinion, would remedy the deficiencies of the art discussed above, as applied against the independent claims herein. Therefore, those claims are respectfully submitted to be patentable over the art of record.

The other claims in this application depend from one or another of the independent claims discussed above, and, therefore, are submitted to be patentable for at least the same reasons. Since each dependent claim is also deemed to define an additional

aspect of the invention, however, individual reconsideration of the patentability of each claim on its own merits is respectfully requested.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,



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